I. C. 7413 JULY 1947

UNITED STATES
DEPARTMENT OF THE INTERIOR
J. A. KRUG, SECRETARY

BUREAU OF MINES
R. R. SAYERS, DIRECTOR

INFORMATION CIRCULAR

APPROVAL OF NEWLY DEVELOPED SELF-CONTAINED BREATHING APPARATUS, INSTRUCTIONS IN ITS CARE AND USE, AND TRAINING PROCEDURE

BY

G. W. GROVE AND E. E. QUENON

Generated on 2024-09-19 17:56 GMT / https://hdl.handle.net/2027/osu.32435030643837
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

I. C. 7413,
July 1947.

INFORMATION CIRCULAR

UNITED STATES DEPARTMENT OF THE INTERIOR - BUREAU OF MINES

APPROVAL OF NEWLY DEVELOPED SELF-CONTAINED BREATHING APPARATUS, INSTRUCTIONS IN ITS CARE AND USE, AND TRAINING PROCEDURE[1]

By G. W. Grove[2] and E. E. Quenon[3]

INTRODUCTION

During September, October, and November 1946, the Safety Division of the Bureau of Mines, of the United States Department of the Interior, Pittsburgh, Pa., tested four new types of self-contained breathing apparatus and approved them in accordance with Schedule 13C. Approval was granted with the proviso that certain specifications outlined on the approval plate be made fully effective, and with the understanding that established safe practices in training in the care and use of self-contained breathing apparatus are of major importance.

The excellent records made during the past 30 years in the safe use of self-contained breathing apparatus, some of which required the almost continuous wearing of apparatus during several hours daily for days, weeks, or months, may be attributed largely to the Bureau's system of rescue organizations, selection of physically fit rescue workers, effective training, and educational work done in rescue and recovery operations during fires or following disasters and in the care and use of self-contained breathing apparatus. Loss of life during wearing of breathing apparatus was due almost invariably to poorly assembled or otherwise defective apparatus, poor physical condition of the wearer, or insufficient training or some incorrect procedure.

The newly developed breathing apparatus are of much simpler design than the conventional type used for the past several years; however, it is just as important to select rescue crews carefully and to train them properly in the care, use, and limitations of the new types of apparatus as for the older long-established types, if anything like safety is to be achieved in using them. The Bureau of Mines considers that 1/2-hour and 3/4-hour self-contained breathing apparatus should be used only as auxiliary equipment in mine rescue and recovery work, and their capabilities and limitations should be well understood by those who wear them.

1/ The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from Bureau of Mines Information Circular 7413."

2/ Supervising engineer, District A, Health and Safety Branch, Bureau of Mines, Pittsburgh, Pa.

3/ Mining engineer, Bureau of Mines, Pittsburgh, Pa.

Generated on 2024-09-19 17:52 GMT / https://hdl.handle.net/2027/osu.32435030643837
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

DETAILS OF APPROVAL

The apparatus recently approved by the Bureau of Mines and discussed in this publication are as follows:

Chemox Self-Contained Oxygen Breathing Apparatus

Approval No. 1307 was issued to the Mine Safety Appliances Co., Pittsburgh, Pa., on October 3, 1946, for the Chemox self-contained breathing apparatus, which is approved only when the following conditions are satisfied:

1. It is known and used as a 3/4-hour, self-contained, oxygen-generating breathing apparatus.

2. When the Chemox breathing apparatus is worn with the same type facepiece as approved with the apparatus, the facepiece shall be stamped with the Bureau of Mines Approval No. 1307.

3. A plate bearing the approval of permissibility shall be securely attached to the front of the canister housing. The approval plate shall bear the following:

PERMISSIBLE

THREE-QUARTER HOUR

SELF-CONTAINED OXYGEN-GENERATING

BREATHING APPARATUS

(SEAL)

APPROVAL NUMBER 1307

Issued for safety, practicability, and

efficiency in general service to the

MINE SAFETY APPLIANCES COMPANY

PITTSBURGH, PENNSYLVANIA, U.S.A.

Generated on 2024-09-19 17:51 GMT / https://hdl.handle.net/2027/osu.32435030643837
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

C A U T I O N

1. Approved only for respiratory protection in oxygen deficient atmospheres, or in vapors or gases which do not poison by skin absorption. (Hydrocyanic acid gas is absorbed through the skin.)

2. Not approved for successive wearing periods or prolonged use in highly concentrated petroleum vapors.

3. Approved only when assembled with Bureau of Mines Approval No. 1307 canister and Bureau of Mines Approval No. 1307 facepiece.

4. The cautions and instructions printed on the oxygen-generating canister must be fully complied with.

5. The Chemox oxygen-generating canister shall be stamped or labeled with the following:

CHEMOX CANISTER

Front Label

PERMISSIBLE
THREE-QUARTER HOUR
CHEMOX OXYGEN-GENERATING CANISTER

APPROVAL NUMBER 1307

Issued for safety, practicability, and efficiency in general service to the MINE SAFETY APPLIANCES CO., PITTSBURGH, PENNSYLVANIA, U.S.A. Approved for use in accordance with the instructions as outlined on the approval plate No. 1307 attached to the Chemox Breathing Apparatus.

C A U T I O N

1. Store in a cool, dry place.
2. Do not remove tear-off cap until ready for use.
3. This canister is good for 3/4 hour's continuous use and should be replaced after each use of apparatus.
4. Never allow ANY substance to enter neck of canister, especially OIL, WATER AND OIL, GASOLINE, GREASE, etc.

Instructions for Use
Before Entering Toxic Atmosphere

1. Remove tear-off cap by pulling metal tab straight out and then straight back across top of cap. Make sure cardboard and metal discs are removed, exposing copper foil seal.

2. Insert in canister holder of apparatus and tighten handwheel until canister gasket is snug against plunger casting.

Generated on 2024-09-19 17:53 GMT / https://hdl.handle.net/2027/osu.32435030643837
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

3. Put on apparatus and adjust facepiece; do not fully tighten straps.

4. Squeeze breathing tubes, place finger between facepiece and face, inhale, release facepiece and exhale into breathing bag. Repeat this procedure until the breathing bag is fully inflated.

5. Tighten facepiece straps fully and breathe normally. If breathing bag is not fully inflated, repeat operation 4. Sufficient oxygen is provided for any breathing requirement.

6. Excessive pressure developed while wearing the apparatus must be released through the release valve attached to the facepiece.

After Use

7. To remove canister, turn handwheel down, swing bail outward, and remove canister with hand suitably protected by glove or other covering, since canister may be hot.

8. To dispose of canister, punch a small hole in front, back, and bottom, and place in bucket of clean water sufficiently deep to cover the canister at least three inches. When bubbling stops any residual oxygen will be dissipated and the canister will be expended. Pour the residual water which is caustic down a drain or dispose in any other suitable manner.

MINE SAFETY APPLIANCES COMPANY

PITTSBURGH, PENNSYLVANIA MADE IN U.S.A.

Back Label

C A U T I O N

Never allow ANY substance to enter neck of canister, especially WATER, OIL, WATER AND OIL, GASOLINE, GREASE, etc., as chemical contains oxygen which will cause combustion of any inflammable material with which it is brought in direct contact, especially if such materials are moist.

Disposal

A used canister will contain some oxygen which should be removed by the action of clean water. Punch a small hole in front, back, and bottom, and place in bucket of clean water sufficiently deep to cover canister at least three inches. When bubbling stops, the oxygen is removed and the canister expended. Pour the residual water which is caustic down a drain or dispose of in any other suitable manner.

STORE HORIZONTALLY THIS SIDE DOWN

Generated on 2024-09-19 17:52 GMT / https://hdl.handle.net/2027/osu.32435030643837
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Top Label

CAUTION
Never Allow
ANY Substance to
Enter Neck
of Canister

REMOVE
TEAR-OFF CAP.
MAKE SURE CARDBOARD
AND METAL DISCS ARE
REMOVED EXPOSING
COPPER FOIL
SEAL

The Chemox self-contained oxygen-generating apparatus operates independently of the outside air; it is equipped with a canister containing potassium tetroxide, which, upon contact with the moisture of the exhaled breath, evolves sufficient oxygen for breathing requirements; the canister also absorbs the exhaled carbon dioxide.

The Chemox apparatus should be stored and started at temperatures above 32° F. When thus stored and started, the wearer may enter and wear the apparatus in temperatures down to 0°F. When starting the apparatus at temperatures near freezing, more inhalations from the outside air, with exhalation into the canister, may be required to start and to produce the proper chemical reaction. The best procedure in starting is to keep fully inflating the breathing bag and then deflating it with the elbows until about 15 exhalations have been put through the canister.

Although the apparatus is simple to wear, persons wearing it should be thoroughly trained in its use, limitations, and maintenance; this is extremely important.

Scott Air-Pak Self-Contained Breathing Apparatus

Approval No. 1308 was issued to the Scott Aviation Corp., Lancaster, N. Y., on October 3, 1946, approving the Scott Air-Pak self-contained breathing apparatus only when the following conditions are in full effect:

1. It is known and used as a half-hour, self-contained, compressed-air breathing apparatus.

2. When the compressed-air cylinder is not charged with more than 1,980 pounds per square inch (1,800 pounds, plus 10 percent, as allowed by the Interstate Commerce Commission).

3. When the facepiece is stamped or plainly marked with Approval No. 1308.

4. When the regulator assembly is stamped or plainly marked with Approval No. 1308.

5. When a metal plate bearing the following information is securely attached to the apparatus:

Generated on 2024-09-19 17:49 GMT / https://hdl.handle.net/2027/osu.32435030643837
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

PERMISSIBLE

ONE-HALF HOUR

SELF-CONTAINED COMPRESSED AIR

BREATHING APPARATUS

(SEAL)

APPROVAL NUMBER 1308

Issued for safety, practicability, and

efficiency in general service to the

SCOTT AVIATION CORPORATION

LANCASTER, NEW YORK, U.S.A.

C A U T I O N

1. Approved only for respiratory protection in oxygen-deficient atmospheres, or in vapors or gases which do not poison by skin absorption. (Hydrocyanic acid gas is absorbed through the skin.)

2. Approved only when the compressed-air cylinder is charged with air furnished by the manufacturer of the apparatus or by a reliable producer of compressed gases, and when the compressed air does not contain less than 20.50 percent oxygen and not more than 0.005 percent carbon monoxide.

3. Approved only for use with Bureau of Mines Approval No. 1308 facepiece and Bureau of Mines Approval No. 1308 pressure regulator and assembly.

4. Approved only when the compressed-air cylinder is plainly marked, "To be filled with compressed air only."

The Scott Air-Pak self-contained breathing apparatus is relatively light and is simple to assemble and wear, but, as with any type of respiratory equipment used in irrespirable atmospheres, persons wearing the apparatus should be thoroughly trained in its use, limitations, and maintenance; this is of utmost importance if lives are not to be sacrificed uselessly.

Generated on 2024-09-19 17:50 GMT / https://hdl.handle.net/2027/osu.32435030643837
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

M.S.A. Demand-Type Oxygen Mask, Half-Hour Self-Contained Breathing Apparatus

Approval No. 1309 was issued to the Mine Safety Appliances Co., Pittsburgh, Pa., on October 3, 1946, for the demand-type, oxygen-mask, half-hour, self-contained breathing apparatus, provided the following conditions are in full effect:

1. The facepiece approved for the demand-type oxygen mask shall be stamped or marked with Bureau of Mines Approval No. 1309.

2. The regulator assembly shall be stamped or marked with Bureau of Mines Approval No. 1309.

3. A metal plate bearing the following shall be securely attached to the frame of the apparatus:

PERMISSIBLE

ONE-HALF HOUR

SELF-CONTAINED COMPRESSED OXYGEN

BREATHING APPARATUS

(SEAL)

APPROVAL NUMBER 1309

Issued for safety, practicability, and

efficiency in general service to the

MINE SAFETY APPLIANCES COMPANY

PITTSBURGH, PENNSYLVANIA, U.S.A.

C A U T I O N

1. Approved only for respiratory protection in oxygen-deficient atmospheres, or vapors or gases which do not poison by skin absorption. (Hydrocyanic acid gas is absorbed through the skin.)

2. Approved only when the cylinder is charged with compressed oxygen and the cylinder is plainly marked, "To be filled with compressed oxygen only."

Generated on 2024-09-19 17:48 GMT / https://hdl.handle.net/2027/osu.32435030643837
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

3. Approved only for use with Bureau of Mines Approval No. 1309 facepiece and Bureau of Mines Approval No. 1309 regulator and assembly.

This half-hour, self-contained, compressed-oxygen breathing apparatus, like the two preceding types of newly approved self-contained breathing equipment, is simple to assemble and wear, but it, too, has limitations when used in an irrespirable atmosphere, and persons wearing it should be thoroughly trained in its use, limitations, and maintenance. This is important.

M.S.A. Demand-Type Compressed-Air Mask, Half-Hour Self-Contained Breathing Apparatus

Approval No. 1310 was issued to the Mine Safety Appliances Co. of Pittsburgh, Pa., on November 5, 1946, for the Demand-Type Compressed-Air Mask, half-hour, self-contained breathing apparatus. This type apparatus is approved only when the following conditions are in full effect:

1. The apparatus cylinder must be charged with compressed air.

2. The high-pressure cylinder, high-pressure tube, and regulator must not be interchangeable with compressed-oxygen breathing apparatus because of the difference in thread fittings.

3. The assembly parts, which include the facepiece, regulator, and frame, must be plainly marked or stamped with Bureau of Mines Approval No. 1310.

4. A metal plate bearing the following must be securely attached to the metal frame of the apparatus:

PERMISSIBLE

ONE-HALF HOUR

SELF-CONTAINED COMPRESSED AIR

BREATHING APPARATUS

(SEAL)

APPROVAL NUMBER 1310

Generated on 2024-09-19 17:50 GMT / https://hdl.handle.net/2027/osu.32435030643837
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Issued for safety, practicability, and

efficiency in general service to the

MINE SAFETY APPLIANCES COMPANY

PITTSBURGH, PENNSYLVANIA, U.S.A.

C A U T I O N

1. Approved only for respiratory protection in oxygen-deficient atmospheres, or in vapors or gases which do not poison by skin absorption. (Hydrocyanic acid gas is absorbed through the skin.)

2. Approved only when the compressed-air cylinder is charged with air furnished by the manufacturer of the apparatus or by a reliable producer of compressed gases, and when the compressed air does not contain less than 20.50 percent oxygen and not more than 0.005 percent carbon monoxide.

3. Approved only for use with Bureau of Mines Approval No. 1310 facepiece and Bureau of Mines Approval No. 1310 pressure regulator and assembly.

4. Approved only when the compressed-air cylinder is plainly marked, "To be filled with compressed air only."

With but few exceptions, the Mine Safety Appliances Co. demand-type, compressed-air, self-contained breathing apparatus is of the same construction as the Mine Safety Appliances Co. demand-type, compressed-oxygen, self-contained breathing apparatus. The principal differences between them are as follows:

1. The oxygen demand-type apparatus is charged with compressed oxygen, and the air demand-type apparatus is charged with compressed air.

2. The high-pressure cylinder, high-pressure tubes, and regulators are not interchangeable because of the difference in thread fittings.

3. The assembly parts of the air demand-type apparatus are stamped or marked with Bureau of Mines Approval No. 1310, and the assembly parts of the oxygen demand-type apparatus are marked with Bureau of Mines Approval No. 1309.

4. The compressed-air cylinders are painted aluminum color and plainly marked "To be filled with compressed air only," and the compressed-oxygen cylinders are painted green.

Generated on 2024-09-19 17:48 GMT / https://hdl.handle.net/2027/osu.32435030643837
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

As with the other three new types of self-contained breathing apparatus described in this circular, persons wearing it should be thoroughly trained in its use, limitations, and maintenance.

Instructions in the care, use, and limitations of the oxygen demand-type breathing apparatus are applicable also to the compressed-air demand-type breathing apparatus.

INSTRUCTIONS IN THE CARE AND USE OF RECENTLY APPROVED APPARATUS

Care and Use of the Scott Air-Pak Breathing Apparatus

The following instructions in the care and use of the Scott Air-Pak breathing apparatus should be followed in atmospheres having breathing hazards:

1. Remove Air-Pak assembly from case by grasping chest strap and lifting over head.

2. Slip the back pack over the head.

3. Snap the side harness and adjust. Fasten the waist belt and adjust.

4. Clip the regulator to the loop on the harness chest strap..

5. Open the cylinder valve two or three full turns (counterclockwise). Observe the cylinder pressure indicated on the regulator gage. The full charge is 1,980 pounds per square inch (1,800 + 10 percent at 70° F.). If the cylinder is not fully charged, operational time will be reduced. Lock the valve open.

6. Put on the mask, chin first, and pull the straps comfortably tight. Tighten the chin strap first, then progressively tighten the straps to the top of the head.

7. Test the mask and hose for leaks. The mask should collapse to the contour of the face with no air leakage when attempts are made to inhale with the opening of the inhalation tube closed. Test the exhalation valve by blowing with quick connect opening still closed. All expired air should pass freely through the exhalation valve. Connect the tube to the regulator.

8. Emergency by-pass valve:

   a. The red by-pass valve should remain <u>closed</u> except in event of damage to the regulator while in service or when it fails to function properly.

   b. Open the <u>red</u> by-pass valve knob (counterclockwise). This provides a flow of air to the mask hose, "by-passing" the regulator mechanism. Adjust the flow with the valve as required.

   c. The yellow main line valve knob should remain locked <u>open</u> except during operation of the emergency by-pass valve.

Generated on 2024-09-19 17:52 GMT / https://hdl.handle.net/2027/osu.32435030643837
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

d. Close the yellow main-line valve (clockwise) only after the red by-pass valve has been opened; this prevents loss of air through damaged or out-of-order regulator mechanism.

9. Do not attach the mask hose "quick connect" to the regulator until ready to enter the contaminated area; this conserves air supply. Tighten firmly; this is important.

10. Method of changing cylinders:

The cylinders on the Scott Air-Pak can be replaced either with the Air-Pak laid out on the floor, or with it on the back of the wearer; in both cases the method is as follows:

a. Close the cylinder valve.

b. Loosen the hose coupling with the wrench supplied, and uncouple manually.

c. Raise the lever to release the cylinder.

d. Remove the cylinder and replace it with a charged cylinder.

e. Lock the cylinder in place by lowering the lever, attach the regulator hose and tighten the coupling.

f. Open the valve, attach the safety chain, and observe the pressure on the regulator.

11. Method of packing and storing:

a. After each use, inspect the mask and hose for tears, punctures, or breaks; if they are in good condition, scrub the mask and hose with a brush using warm soap-and-water solution. Rinse them with warm water and dry, then disinfect the mask and hose and air-dry.

b. Wipe off any dirt accumulations from the rest of the equipment. Inspect the buckles, straps and hose for possible punctures or breaks.

c. Replace the used cylinder with a freshly charged one; open and close the valve and test for leakage by observing the regulator gage. After the valve is closed, the pressure, as shown on the gage, should not drop.

d. Exhaust the air pressure from the regulator and hose by placing the mouth over the quick connect opening and inhaling until the gage pointer indicates "0" pressure.

e. Place the back plate flat in the case, folding the straps over the top. Arrange the regulator hose so it is not forced or cramped. Put in the mask and the corrugated hose assembly loosely.

Generated on 2024-09-19 17:52 GMT / https://hdl.handle.net/2027/osu.32435030643837
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

f. Store flat, preferably in a cool, dry place.

Compressed air flows from the high-pressure cylinder through the high tube to the regulator, where the pressure is reduced to a breathable limit; it then flows into the facepiece and into the lungs, and then is exhaled direct to the atmosphere. The Scott Air-Pak apparatus is so designed that it operates without recirculating the compressed air.

Care and Use of the Mine Safety Appliances Co. Oxygen-Generating Breathing Apparatus

The following instructions in the use and maintenance of the Mine Safety Appliances Co. Chemox oxygen-breathing apparatus should be followed:

1. Unfasten and straighten all harness straps.

2. With one hand grasp the apparatus by the plunger casting, dropping the facepiece over the hand holding the apparatus. With the other hand grasp the D-ring assembly where the two large web straps join, placing the breast plate of the canister holder on the chest and slipping the head through the V-shaped opening formed by the two web straps.

3. Continue to hold the apparatus on the chest with one hand and with the other reach around the body at one side and grasp the free end of the web strap on that side. Bring the end of the strap under the arm and snap into the D-ring located on the top side of the breast plate. Repeat this procedure for the other strap.

4. Adjust the position of the apparatus on the body by means of metal slides located on the web harness straps. The position of the apparatus on the body should be such that when the facepiece is put on, the breathing tubes will permit free head movement.

5. Attach the waist strap to the small D-ring on the lower corner of the breast plate and pull up to a snug fit, tucking in the loose ends.

6. Remove the metal tear-off cap of the canister by pulling the metal tab straight out, then straight back across the top of the cap, exposing the copper-foil seal, which is the airtight seal for the canister. MAKE SURE THAT THE METAL AND CARDBOARD DISKS ARE REMOVED, EXPOSING THE COPPER-FOIL SEAL. With the handwheel screwed down far enough for the bail to be swung outward, swing the bail outward and insert the canister fully into the canister holder, with the smooth side to the front. The canister should be inserted far enough so the copper-foil seal is punctured and the rubber gasket fits snugly against the V-shaped recess in the plunger casting. Screw the handwheel clockwise until it is tight against the canister. NOTE: THE CANISTER MUST BE INSERTED WITH THE SMOOTH SIDE TO THE FRONT.

7. Pull out the facepiece headband straps so the ends are at the buckles, and grip facepiece between thumb and fingers. Insert the chin well into the lower part of the facepiece and pull the headbands back over the head. To obtain a firm and comfortable fit against the facepiece at all points, adjust headbands as follows:

Generated on 2024-09-19 17:53 GMT / https://hdl.handle.net/2027/osu.32435030643837
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

(a) See that the straps lie flat against the head.

(b) Tighten the lower or "NECK" straps.

(c) Tighten the "SIDE" straps.

(d) Tighten the forehead or "FRONT" strap.

8. Squeeze both breathing tubes with one hand, break the seal of the facepiece against the cheek with a finger, and inhale; then, releasing the breathing tubes and facepiece, exhale into the apparatus. THIS MUST BE DONE IN FRESH AIR. Repeat this procedure until the breathing bag is fully inflated. Depress the pressure-relief valve and force the air from the breathing bag. Reinflate the breathing bag by repeating the starting instructions.

9. To check the complete apparatus for tightness, grasp the facepiece breathing tubes and squeeze them. Inhale; if the facepiece collapses, the facepiece seal is sufficiently tight. Continue to squeeze the breathing tubes and depress both sides of the breathing bag with the elbows. If the breathing bag does not deflate, the apparatus is tight. If a leak is indicated, the apparatus should be checked and the leak corrected before use.

10. Breathe normally, as the apparatus furnishes enough oxygen to meet any breathing requirements.

General Information for Use

There is no need to purge nitrogen manually from this apparatus, as more oxygen is produced than will be used. If the excess oxygen does not automatically escape around the sides of the facepiece, depress the pressure-relief valve on the valve housing at the bottom of the facepiece to relieve excess pressure.

There are two indications, in addition to the timer, that the canister is becoming expended - fogging of the lenses on inhalation and increased resistance to exhalation. These two indications will not normally appear until after 45 minutes of use but may become noticeable under conditions of extremely hard work. The lenses will clear on inhalation until the canister is almost expended; then they will begin to fog. Do not confuse excess breathing-bag pressure with canister resistance; if excess breathing-bag pressure is relieved by use of the pressure-relief valve and exhalation resistance is still present, the canister is about expended. If either of these two indications appear, return to fresh air.

Caution

NEVER ALLOW ANY SUBSTANCE TO ENTER THE NECK OF THE CANISTER, ESPECIALLY OIL, WATER AND OIL, GASOLINE, GREASE, ETC., AS THE CHEMICAL CONTAINS OXYGEN, WHICH WILL BRING ABOUT COMBUSTION OF ANY FLAMMABLE MATERIALS WITH WHICH IT IS BROUGHT INTO DIRECT CONTACT, ESPECIALLY IF SUCH MATERIALS ARE MOIST.

Generated on 2024-09-19 17:52 GMT / https://hdl.handle.net/2027/osu.32435030643837
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

After Use

1. To remove the canister, turn the handwheel down, swing the bail outward, and remove the canister with the hand suitably protected by a glove or other covering, as the canister may be hot. DO NOT REUSE THE CANISTER.

2. Always use the following procedure before discarding the canister: To dispose of the canister, punch a small hole in the front, back, and bottom, and place it in a container of clean water not completely filled but sufficiently deep to cover the canister at least 3 inches. When bubbling stops, residual oxygen will be dissipated and the canister will be expended. Pour the residual water, which is caustic, down a drain or dispose of it in other suitable manner and discard the canister. Especial care should be taken in disposing of used canisters in damp or wet places in mines, especially in coal mines.

Maintenance

The facepiece and breathing-tube assembly (disconnected from the apparatus by detaching the coupling nuts) should be cleaned and disinfected after each use.

This assembly may be cleaned with soap and water and may be disinfected by scrubbing it with a damp (not sopping wet) cloth, using a 3-percent solution of carbolic acid, a 2-percent solution of lysol, or a solution of formaldehyde, made by taking one part of formalin (40-percent solution of formaldehyde) and nine parts of water. The assembly should then be rinsed with water and hung up to dry.

The inhalation and exhalation check valves are removable from the facepiece and breathing-tube assembly by disconnecting the toggle clamps, removing the breathing tubes, and sliding the valves out. They should be checked periodically for corrosion and replaced if necessary. These valves are marked IN for inhalation and EX for exhalation and should be inserted in their respective openings.

While the apparatus is not in use, there should be a periodic check of the plunger and plunger casting (the part that pierces the canister) for cleanliness and free movement of the plunger. Tightness of the apparatus should be checked periodically also, using the procedure outlined in step 9 of these instructions.

When any part shows evidence of failure, it should be replaced immediately with a new part.

Storage

When not in use, the apparatus should be kept in the carrying case provided, and canisters should be stored horizontally in a dry place.

Generated on 2024-09-19 17:50 GMT / https://hdl.handle.net/2027/osu.32435030643837
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

Care and Use of the Mine Safety Appliances Co. Demand-Type Compressed-Oxygen or Compressed-Air Breathing Apparatus

The following instructions in care and use of the Mine Safety Appliances Co. demand-type compressed-oxygen apparatus are applicable also for the Mine Safety Appliances Co. demand-type compressed-air apparatus:

The MSA demand-type oxygen apparatus is a self-contained breathing apparatus operating independently of the outside air. Oxygen from a high-pressure cylinder mounted on the wearer's back is reduced to a suitable breathing pressure by a reducing valve and supplied to the wearer through an admission valve and facepiece breathing-tube assembly. The exhaled breath passes through an exhalation valve in the facepiece to the outside air.

Respiratory protection is provided for a period of 30 minutes at hard physical exertion.

Operating Details

Oxygen flows from the storage cylinder on the back through the high-pressure connecting hose, past the by-pass and main-line valve to the demand regulator on the chest. Here the pressure is reduced to breathing pressure and is supplied to the wearer upon his inhalational demand, passing through the facepiece breathing tube, across the facepiece lens, where it removes any fogging produced by the moisture in the exhaled breath.

On exhalation, the flow to the wearer stops, and the wearer's exhaled breath passes to the outside air through the exhalation valve.

The pressure gage mounted on the regulator continously indicates the pressure in the cylinder.

The by-pass valve, the red handwheel mounted on the side of the regulator, is to be used in the event of failure of any part of the regulator. By opening this valve, the wearer obtains a flow of oxygen at a comfortable breathing pressure, from the high-pressure cylinder to the facepiece, enabling him to return to fresh air and remove the apparatus.

The main-line valve mounted on the front of the regulator enables the wearer to shut off the high pressure at the regulator.

Preparation for Use

The following are the consecutive steps in putting on the apparatus before entering a toxic atmosphere:

1. Open the cylinder-valve handwheel fully and lock it in place, using the snap attached to the back plate of the apparatus; the snap should be snapped through the hole in the handwheel of this valve. The main-line valve mounted on the front of the regulator should be open; the by-pass valve mounted on the regulator should be kept closed except when used for emergency purposes.

Generated on 2024-09-19 17:52 GMT / https://hdl.handle.net/2027/osu.32435030643837
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

2. Slip the left arm through the shoulder harness attached to the plate on which the cylinder is mounted. Lay the plate on the back and slip the right arm through the other shoulder harness. Snap the chest strap to the D-ring on the right shoulder harness and adjust both shoulder and chest straps, if necessary. Fasten and adjust the waist strap. NOTE: The greater part of the weight of the apparatus is carried on the two pads that fit the body above the hip, thus reducing the weight on the shoulders.

3. Turn on the main-line valve on the front of the regulator and observe the pressure gage mounted on the regulator. The pressure gage should indicate approximately 1,980 pounds per square-inch pressure (1,800 + 10 percent at 70° F.) when the cylinder is full. The cylinder should be fully charged in order to obtain the complete service life. Turn off the main-line valve and watch the pressure-gage needle for deflection. Any deflection of the gage needle indicates a leak, which should be stopped before the apparatus is worn. NOTE: Possible sources of leaks are the coupling nuts at the end of the high-pressure hose where it is fastened to the oxygen cylinder or the regulator; these connections can be checked with soapy water and brush. Tightening at these two points often eliminates leakage.

4. Pull out the facepiece headband straps so the ends are at the buckles, and grip the facepiece between the thumb and finger. Insert the chin well into the facepiece and pull the headbands back over the head. To obtain a firm and comfortable fit against the face at all points, adjust the headband as follows:

(a) See that the straps lie flat against the head.

(b) Tighten the lower or "neck" straps.

(c) Tighten the side straps. (Do not interfere with the forehead or front strap.)

(d) Place both hands on the headband pad and push in toward the neck.

(e) Repeat operations (b) and (c).

(f) Tighten the forehead or "front" strap a few notches.

Check the tightness of the facepiece fit by squeezing the breathing tube and inhaling. The facepiece should collapse to the contour of the face if the seal is satisfactory.

5. Breathe normally, as the apparatus furnishes enough oxygen to meet any normal breathing requirements as long as the oxygen lasts.

Use in Toxic Atmosphere

The apparatus furnishes complete respiratory protection for a period of time governed largely by the amount of work done; therefore, it will be necessary to examine the pressure gage periodically, as it continually indicates

Generated on 2024-09-19 17:53 GMT / https://hdl.handle.net/2027/osu.32435030643837
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

the amount of cylinder oxygen remaining. When the pressure-gage needle reaches the colored section of the gage, always return to fresh air. There is approximately 300 pounds of oxygen still available when the needle enters the colored section; roughly, this is enough for approximately 5 to 7 minutes.

Caution

Never use any lubricant on any part of the apparatus, and always keep all parts entirely free from oil or grease.

After Use

1. To remove the oxygen cylinder for recharging, disconnect the coupling nut of the high-pressure tube from the cylinder valve, using the open-end wrench provided with the apparatus. Unfasten the catch of the metal strap holding the cylinder and remove the cylinder.

2. Recharge the cylinders to 1,980 pounds pressure and reassemble to the apparatus, slipping the cylinder valve through the opening on the bottom of the back plate and fastening the catch on the metal strap after positioning the cylinder. Attach the coupling nut of the high-pressure tube to the cylinder valve and pull up firmly with an even motion of the end wrench.

Maintenance

The facepiece and breathing-tube assembly (after disconnecting from the apparatus) should be cleaned and disinfected after each use.

This assembly may be cleaned with soap and water and may be disinfected by scrubbing it with a damp (not sopping-wet) cloth, using a 3-percent solution of Lysol or a solution of formaldehyde made by taking one part of formalin (40-percent solution of formaldehyde) and nine parts of water. The assembly should then be rinsed with water, hung up, and permitted to dry thoroughly before use.

When the apparatus is not in use, the cylinder pressure and the tightness of the apparatus should be examined periodically by the procedure outlined in paragraph 3 of Preparation for Use.

The complete apparatus should be examined periodically, and if any part shows evidence of failure it should be replaced immediately with a new part.

Storage

When not in use, the apparatus should be kept in the carrying case provided.

TRAINING PROCEDURES

It is highly important that persons who expect to wear breathing apparatus in irrespirable atmospheres be physically fit and properly instructed

Generated on 2024-09-19 17:50 GMT / https://hdl.handle.net/2027/osu.32435030643837
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY

and trained in the construction, testing, use, and care of such apparatus. Moreover, apparatus men, after receiving thorough initial training, should receive additional training at least every 6 months to keep them familiar with the apparatus and its limitations. Many persons have gotten into difficulties, with serious and even fatal results, while wearing self-contained breathing apparatus, and in almost every instance this was the result of poor physical condition of the wearer, poorly assembled or otherwise defective apparatus, lack of or improper training, or improper procedure. Therefore, the necessity of proper and sufficient instruction and training in the use and care of breathing apparatus of all types cannot be emphasized too strongly, and this definitely includes all four types of apparatus described in this circular.

Procedures, following mine explosions and fires, in the care and use of self-contained breathing apparatus, as explained in numerous Bureau of Mines publications, especially the information contained in Miners' Circulars Nos. 33, 34, 35, and 36 and the handbook on self-contained breathing apparatus, should be followed whenever applicable to the newly developed Scott Air-Pak, Chemox oxygen-generating, MSA compressed-oxygen, and MSA compressed-air demand types of breathing apparatus.

Persons qualifying for Bureau of Mines initial mine rescue certificates will be required to train for at least 20 hours, with 10 hours of the course devoted to actual wearing of apparatus in accordance with the Bureau's present requirements.

As 1/2-hour and 3/3-hour apparatus are approved only as auxiliary mine rescue apparatus, the 2-hour, conventional-type, self-contained apparatus will be used as the basis for the training; however, a portion of the time should be devoted to other types of breathing apparatus, and special emphasis may be placed upon any certain type of breathing apparatus during the training. A portion of the time required to be spent in wearing the 2-hour-type apparatus may also be applied to other types of breathing apparatus. Mine rescue certificates will not be issued for training done with auxiliary types of breathing apparatus only, such as the four types described in this circular.

CONCLUSIONS

Self-contained breathing apparatus can be used with reasonable safety while performing work under extremely hazardous conditions, provided each wearer is physically fit and expertly trained in procedures following fires and explosions and in the care, use, and limitations of the apparatus.

The types of apparatus described in this publication, because of their small capacity (1/2 and 3/4 hour), are approved only as auxiliary apparatus for mine rescue work. They should not be used in mine work, therefore, except very close to fresh air, and unless at least one team of five or six men equipped with 1-hour and preferably 2-hour self-contained breathing apparatus is in reserve at the fresh-air base.

Persons directing rescue and recovery operations following mine explosions and fires should, without exception, follow the best-known and established safety practices in the protection of those who are engaged in such work, and it should always be stressed that no type of breathing apparatus is "foolproof" either in its construction or in its use in an irrespirable atmosphere.

Generated on 2024-09-19 17:49 GMT / https://hdl.handle.net/2027/osu.32435030643837
Public Domain, Google-digitized / http://www.hathitrust.org/access_use#pd-google
Digitized by Google
Original from THE OHIO STATE UNIVERSITY